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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,285	08/27/2003	Avinoam Kornblit	18-14-12-2-5-1-16	5499

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Docket Administrator (Room 3J-219)  
Lucent Technologies Inc.  
101 Crawfords Corner Road  
Holmdel, NJ 07733-3030

EXAMINER

VASUDEVA, AJAY

ART UNIT PAPER NUMBER

3617

DATE MAILED: 03/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/649,285	<b>Applicant(s)</b> KORNBLIT ET AL.	
	<b>Examiner</b> Ajay Vasudeva	<b>Art Unit</b> 3617	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-5 is/are pending in the application.
- 4a) Of the above claim(s) 6-11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 5 is/are rejected.
- 7) ☒ Claim(s) 3 and 4 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |                                                                                                                                              |                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                                  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                                         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/28/2005</u> | 6) <input type="checkbox"/> Other: _____                                                |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election of claims in Group I (claims 1-5) in the reply filed on 10/18/2005 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claims 6-11 are therefore withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim.

### ***New Rejection***

2. The examiner had previously indicated that inclusion of certain subject matter in the claims would be favorable considered for allowance. However, due to a reconsideration of the claim's functional limitations in a different context, this Office Action now contains a non-final rejection based on new grounds. Although the claims were amended to include the recommended subject matter, they are not yet deemed to be in condition for allowance in view of the new interpretations, as detailed below.

This Office Action is a non-final rejection. The examiner regrets the resulting inconvenience to applicants and their representative.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Japan 2001-114185 A ('185).

Re claims 1, the limitations of the apparatus claim have been evaluated by differentiating it between (i) the structural limitations and (ii) the functional limitations.

NOTE: While features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function alone. See MPEP 2114.

Even if the prior art fails to explicitly disclose limitations recited as functional language, if the prior art (i) discloses all claimed structural limitations and (ii) the disclosed structure is capable of performing the recited function, the prior art meets the requirements of the claim. (See *In re Swinehart*, 169 USPQ 226 (CCPA 1971); *In re Schreiber*, 44 USPQ2d 1429).

(i) The structural limitations of the claim 1 recite:

"An apparatus comprising: a surface body,... and a plurality of nanostructures or microstructures ... disposed in a pattern on said surface"

With respect to the structural limitation of claim 1, JP ('185) discloses an apparatus comprising a surface on a body and a plurality of microelectrodes (microstructures) disposed in a pattern on the surface. Specifically, JP ('185) shows a mechanism for changing friction between a fluid and a body surface [16] (figure 4), achieved by application of an electrical current. The body surface acts as an electrode

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(see previously supplied machine translation: col. 5, lines 3, 11-16, 45-50), and comprises a conductive matter, such as carbon black disposed on the surface (col. 5, line 35). The mean particle diameter of carbon black is disclosed as 1 micrometer or less (col. 5, line 41). Therefore, the conductive matter like carbon black is considered equivalent to the recited nanostructure because it has a dimension less than one micrometer.

(ii) The functional limitations of the claim recite:

"in a way such that (i) friction between said surface and said fluid is controlled as a function of a surface energy of said nanostructures or microstructures and wherein (ii) said friction control is a function of a variable degree of contact between said surface and said fluid resulting from an electrically-induced penetration of at least a portion of said fluid through said nanostructures or microstructures disposed on said surface."

The above limitations do not recite any specific structure, but merely set forth a functional limitation. A functional limitation in an apparatus claim defines a capability of a structure in terms of (a) what it does or (b) by a property/characteristic it has, rather than by what it is.

As described above, JP ('185) shows a mechanism for influencing friction between a fluid and a body surface by application of an electrical current. The application of current is considered variable because the polarity of current can be alternately changed between a positive and negative potential (see fig. 4). Additionally, applicants may also note that even an absence or presence of electrical current – such as caused by switching off and switching on of the current -- is considered to provide variable electrical current.

Although JP ('185) does not explicitly disclose all of the functional limitations of the claim, these limitations have been evaluated in a "capability" context.

With respect to the first functional limitation "friction between said surface and said fluid is controlled as a function of a surface energy of ... microstructures", JP ('185) shows a mechanism for applying variable electrical current through microelectrodes, as explained above. Secondly, the friction between the fluid and the body surface would be directly influenced by the presence/absence, as well as the polarity, of the current. As such, any application of variable electrical current would correspondingly vary the friction between the surface and the fluid.

With respect to the second functional limitation "said friction control is a function of a variable degree of contact between said surface and said fluid resulting from an electrically-induced penetration of ... fluid through ... microstructures", any application of an electric current would invariably and inherently alter the surface tension of the fluid surface according to the universal laws of physics, whether or not one recognizes such phenomenon as taking place. Therefore, any change in the surface tension caused by the application of a variable electric current would correspondingly alter the penetration of fluid through the microstructures.

**Note:** Although the device of device JP ('185) does not deliberately alter the penetration of fluid through the microstructures, such device will nonetheless achieve the claimed functionality, at least as an unintended consequence.

Because the structure of JP ('185) is capable of performing the recited functions, it meets the limitations of claim 1.

Re claim 2, the body surface is that of a marine hull. Although the hull is not a submersible hull that is completely disposed under water, the hull has a portion that is at least partially under a waterline.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 2 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over DE 19704207 A1 ('207) in view of Japan 08-128413 A ('413).

DE ('207) shows a body surface [3] adapted to move through a fluid (figures 4 and 5), having a plurality of fibers [6] disposed in a pattern on the surface to control friction between the surface and the fluid. Specifically, the friction between the surface and the fluid is controlled by application of electrical energy on the fibers. The electric current potential can be varied by use of regulated energy source (fig. 6 and 7; see page 4 of the translation provided by the applicant).

DE ('207) discloses all structural features recited in claim 1, except the dimensions of the fibers.

JP ('413) teaches a reduction of friction experienced by a ship surface moving through a fluid (col. 1 of the attached translation; and figure 4). The ship has a plurality of fibers [61]

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disposed in a pattern on the surface to control friction. The fibers have a thickness of about 4.8 micrometers and a height of about 0.5 mm.

At the time of the invention, it would have been obvious for one skilled in the art to make the fibers of DE ('207) with a thickness of about 4.8 micrometers and a height of about 0.5 mm, as taught by JP ('413). Having such fiber dimensions would have ensured a reduction in friction not only when the electric current was applied to the fibers, but even when it was not possible to supply such current. The fibers are considered equivalent to the claimed microstructures because they have a dimension less than one millimeter.

See examiner's interpretation regarding the functional limitations of the claim, as described in ¶4 above. The structure of modified DE ('207) is considered as capable of performing the recited functions of the claimed invention -- at least as an unintended consequence --, and therefore meets the functional limitations of claim 1.

Re claim 2, please see ¶4 of this Office action for Examiner's interpretation of the claim.

Re claim 5, although the change in resistance between the surface and the fluid is disclosed to occur by a process of fluid ionization, it is noted that a mere presence or absence of electric current on the fibers will also cause a variable penetration of fluid through the microstructures for a different degree of contact with the surface, even though such has not been expressly stated in DE ('207). Such changing resistance will at least change the speed of the surface.



***Response to Arguments***

7. Applicant's arguments with respect to claims 1, 2 and 5 have been considered but are not persuasive.

Re the 102(b) rejection based on JP ('185), applicant has argued that the device of JP ('185) does not teach a drag reduction through utilization of nanostructures or microstructures on a surface in such a way that contact between the surface and a fluid is reduced, and the claimed friction control is a function of a surface energy of the nanostructures or microstructures, resulting from an electrically-induced penetration of fluid through the nanostructures or microstructures.

Response: JP ('185) shows all structural limitation set forth in claim 1. Regarding the functional limitation, although there is no deliberate attempt to alter the penetration of fluid through the microstructures, such device will nonetheless achieve the claimed functionality -- at least as an unintended consequence -- when variable current is applied to the microstructures.

Applicant is reminded that while features of an apparatus may be recited either structurally or functionally, claims directed to an apparatus must be distinguished from the prior art in terms of structure rather than function alone. See MPEP 2114. Even if the prior art fails to explicitly disclose limitations recited as functional language, if the prior art (i) discloses all claimed structural limitations and (ii) the disclosed structure is capable of performing the recited function, the prior art meets the requirements of the claim. (*See In re Swinehart*, 169 USPQ 226 (CCPA 1971); *In re Schreiber*, 44 USPQ2d 1429).

Please see the detailed rejection in ¶4 of this Office action.

Re the 103(a) obviousness rejection, applicant has argued that (i) the device of DE ('207) achieves friction control by affecting a turbulent envelope, as described on page 3 of the translation (provided by the applicant), and not by reducing the contact between the surface and a fluid. Applicant further argues that (ii) the device of DE ('207) requires that the fibers be laid out with their free ends pointing in a direction opposite the direction of movement. Further, (iii) DE ('207) achieves friction control by an ionization and subsequent migration of water surrounding the floating body, and does not teach the friction control as being a function of a variable degree of contact between the fluid and the surface.

Response: (i) The turbulent envelope technique described on page 3 of the translation is only the first embodiment of the invention (fig. 1-3). The device discussed by examiner is described as the second embodiment of figures 4-7.

(ii) The argument that DE ('207) requires the fibers to be laid out with their free ends pointing in a direction opposite the direction of movement is not considered relevant because such features have not been included in the claim(s).

(iii) Re the argument that friction control in DE ('207) is achieved by an ionization and subsequent migration of water surrounding the floating body, applicant may note that any migration of water toward/away from the body would affect the degree of contact between the fluid and the surface. Therefore, although the friction control is achieved by ionization, it would still result in a variable degree of contact between the fluid and the surface. Secondly, it is noted that DE ('207) shows a provision of varying the electric current potential by use of regulated energy source (fig. 6 and 7; see page 4 of the translation provided by the applicant). Therefore, the apparatus is at least capable of applying a current at less than the ionization potential of water, which would result in a variable degree of contact between the fluid and the surface due

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to a change in surface properties of water as governed by the laws of physics, by without causing any ionization of water.

Further, if the device of DE ('207) were used in a different fluid medium with an extremely high ionization potential not attainable by the battery of DE ('207), the device DE ('207) would still alter the contact between the surface and the fluid even without causing an ionization of such fluid.

As stated previously, even if there is no deliberate attempt to alter the penetration of fluid through the microstructures, such claimed functionality could be achieved under certain conditions, as described above, merely as an unintended consequence.

#### ***Allowable Subject Matter***

8. Claims 3 and 4 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Conclusion***

9. This is a non-final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ajay Vasudeva whose telephone number is (571) 272-6689. The examiner can normally be reached on Monday-Friday 12:00 -- 5:30 pm.


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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, S. Joe Morano can be reached on (571) 272-6684. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AV

Ajay Vasudeva  
Examiner  
Art Unit 3617

  
AJAY VASUDEVA 2/1/06  
PATENT EXAMINER